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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/882,719	06/15/2001	Robert Joseph Bouchard	CL1673 US NA	1392

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EXAMINER

MACCHIAROLO, PETER J

ART UNIT	PAPER NUMBER
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2875

DATE MAILED: 11/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/882,719

Applicant(s)

BOUCHARD ET AL.

Examiner

Peter J Macchiarolo

Art Unit

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NW

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17, 24-39 and 54-82 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-17, 24-39 and 54-81 is/are rejected.
- 7) ☒ Claim(s) 7, 28, 60 and 82 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 January 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 17.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. The reply filed on July 28, 2003 consists of changes to the specification, drawings, and to the claims, an IDS, and further, the reply consists of remarks related to the prior rejection of claims in the First Office Action. The above have been entered and considered. However, pending claims 1-17, 24-39, and 54-82 are not allowable as explained below.

Claim Objections

2. Claims 7, 28, 60, and 82 are objected to because of the following informalities:
3. Claims 7 and 28 recite, "said graphene planes," however, there is not proper antecedent basis for this term. The Examiner is interpreting this term as "graphene platelets."
4. Claim 60 recites, "said material," and "the material." The Examiner is interpreting this term to indicate the same material.
5. Claim 82 recites, "a plurality of conductive pattern is formed thereon." The Examiner recognizes this grammatical error and interprets this limitation as "a plurality of conductive patterns [is] are formed thereon."
6. Appropriate correction is required.

Drawings

7. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the structural relationship between the graphene platelets and the fiber axis as recited in claim 7 and 28, and the process for

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improving an electron field emitter comprising forming a CNT layer, drying, firing, and taping the device as claimed in claim 82 must be shown or the feature(s) canceled from the claim(s).

No new matter should be entered.

8. The Examiner appreciates the fact that illustrating a composition comprising carbon fibers is difficult; however, a detailed drawing showing a single carbon fiber with the recited structural relationship will elucidate the claimed structure.

9. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

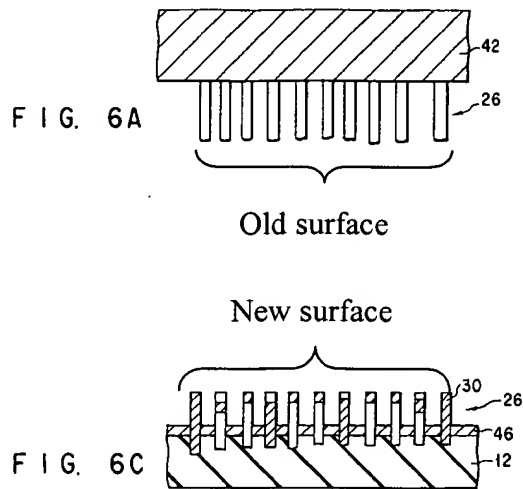
10. The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

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11. Claims 1-4, 13-15, 24-26, 29-32, 34-36, 38, 54, 60-70, 76, and 81 are rejected under 35 U.S.C. 102(e) as being anticipated by Nakamoto (USPN 6,097,138; "Nakamoto").

12. In regards to claims 1, 24, 34, 60, 61, 66, 76, 81, Nakamoto discloses a method for improving the field emission of an electron filed emitter in figures 6A-6D. The method comprises contacting a material (synthetic resin layer 44 in a molten state) with the electron field emitter (42 and 26), wherein there is no translational motion by the material with respect to the electron field emitter, and the material forms an adhesive contact with the electron field emitter. The adhesive force is such that when the material is separated from the electron field emitter, a portion of the electron field emitter (26) is removed, thereby forming a new surface of the electron field emitter. Nakamoto further discloses in figures 6A-6D that the material is separated from the electron field emitter, and that the acicular particles protrude from the surface.

13. In regards to claims 2, 13, 64, 65, and 67-69, Nakamoto discloses all of the recited limitations of claims 1 and 61 (above). Nakamoto further discloses a process for improving the field emission of an electron filed emitter in figures 6A-6D. The process comprises applying a force to the surface of the electron field emitter (42 and 26) in a direction essentially normal to the plane of the electron filed emitter, before the electron field emitter is fired (see column 6, lines 37-45 and fig. 1A), wherein the force fractures and removes a portion (26) of the electron field emitter thereby forming a new electron field emitter surface (below).



14. In regards to claims 3, 4, 14, 15, 25, 26, 29, 30-32, 35, 36, 38, and 70 Nakamoto discloses all of the recited limitations of claims 2, 13, and 61 (above).

15. Nakamoto further discloses in the abstract and in column 2 lines 23-25 that the acicular carbon is comprised of carbon nanotubes, and this configuration increases the field emission efficiency and reduces the consumption power.

16. The Examiner notes that the preambles of claims 30-32, 35-36, and 38 recite particular devices that has the electron field emitter which has been improved. This is an intended use type preamble, and is not afforded any patentable weight, since it merely recites the intended use of the electron field emitter. Where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone, the preamble is generally not accorded any patentable weight. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

17. In regards to claim 54, Nakamoto discloses all of the recited limitations of claim 1 (above).

18. Nakamoto further shows in figures 9A-9D that the electron field emitter (12, 14) is rearranged into one modification with little or none of the electron field emitter being removed.

19. In regards to claim 62, Nakamoto discloses a method for improving the field emission of an electron field emitter in figures 6A-6D. The method comprises contacting a material (synthetic resin layer 44 in a molten state) with the electron field emitter (26) before the electron field emitter is fired (see column 6, lines 37-45 and fig. 1A), and the material forms an adhesive contact with the electron field emitter. The adhesive force is such that when the material is separated from the electron field emitter, a portion of the electron field emitter is removed, thereby forming a new surface of the electron field emitter.

20. In regards to claim 63, Nakamoto discloses a method for improving the field emission of an electron field emitter in figures 6A-6D. The method consists essentially of contacting a material (synthetic resin layer 44 in a molten state) with the electron field emitter (42 and 26), and the material forms an adhesive contact with the electron field emitter. The adhesive force is such that when the material is separated from the electron field emitter, a portion of the electron field emitter (26) is removed, thereby forming a new surface of the electron field emitter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

21. Claims 5, 6, 16, 17, 27, 33, 37, 39, 71, and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto in view of Bower et al (USPN 6,277,318 "Bower").
22. In regards to claims 5, 6, 16, 17, 27, 33, 37, 39, 71, and 72, Nakamoto teaches all of the recited limitations of claims 4, 15, 71 (above) and 5 (below).
23. Nakamoto is silent to the carbon nanotubes being single walled carbon nanotubes.
24. However, Bower teaches in column 3, lines 43-60, that laser ablation grown single wall carbon nanotubes are used as the electron emitters. Bower further teaches in column 1, lines 49-52, and column that using these nanotubes allows for the formation of more useful and robust electron emitting device structures. Further, the Examiner takes Official Notice that using laser ablation grown single walled CNT's for an electron-emitting device is well known in the art.
25. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the method of Nakamoto to improve the field emission of an electron filed emitter, including Bower's nanotubes, since Bower teaches that using laser ablation grown single wall carbon nanotubes allows for the formation of more useful and robust electron emitting device structures, and also because they are well known in the art.
26. The Examiner notes that the preamble of claims 33, 37, and 39 recite particular devices that has the electron field emitter which has been improved. This is an intended use type

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preamble, and is not afforded any patentable weight, since it merely recites the intended use of the electron field emitter. Where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone, the preamble is generally not accorded any patentable weight. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

27. In regards to claims 55-58, 73, and 74, Nakamoto and Bower teach all of the recited limitations of claims 4, 5, 70, and 71 (above).

28. Although Nakamoto and Bower are silent to using multiwall CNT's, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use multiwall CNT's, since the Examiner takes Official Notice of the equivalence of multiwall CNT's and single walled CNT's for use as electron emitters and the selection of any of these known equivalents to emit electrons would be within the level of ordinary skill in the art.

29. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto in view of Bower in further view of Kim et al (USPN 6,146,230; "Kim").

30. In regards to claims 8-11, Nakamoto and Bower teach all of the recited limitations of claims 5 (above).

31. Both Nakamoto and Bower are silent to the exact percent weight of the nanotubes.

32. However, Kim teaches in column 3 lines 29-37, that a preferable amount of electron emitting carbon nanotubes is 1 to 50 wt %. Kim further teaches that when the nanotubes are less

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than 1 wt %, the electrons are rarely emitted from the material, and when the amount of the electron emitting material exceeds 50 wt %, manufacturing becomes difficult.

33. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the method of Nakamoto to improve the field emission of an electron filed emitter, including Bower's nanotubes, further including Kim's percent weight, since Kim teaches when the nanotubes are less than 1 wt %, the electrons are rarely emitted from the material, and when the amount of the electron emitting material exceeds 50 wt %, manufacturing becomes difficult.

34. Claim 75 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto in view of Kim.

35. In regards to claim 75, Nakamoto discloses all of the recited limitations of claims 70 (above).

36. Claim 75 is rejected for the same reason as 8 (above).

37. Claims 7 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto in view of Baker et al (USPN 5,618,875; "Baker").

38. In regards to claims 7 and 28, Nakamoto discloses all of the recited limitations of claim 3 (above).

39. Nakamoto is silent to the particular type of carbon nanotubes used in the device.

40. However, Baker teaches in column 3, line 47 to column 4, line 6; column 4 lines 29-37; and column 2, lines 27-29, that acicular carbon is comprised of carbon fibers which are grown

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from the catalytical decomposition of carbon-containing gases over small metal particles, each of which have graphene platelets arranged at an angle with respect to the fiber axis so that the periphery of the carbon fiber consists essentially of the edges of the graphene plates, and further that these fibers allow for high performance composite materials containing superior reinforcing components and which also conduct electricity.

41. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the device of Nakamoto including the fibers of Baker, since this configuration will allow for high performance composite materials containing superior reinforcing components and which also conduct electricity.

42. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zetl et al (USPN 6,057,637; "Zetl").

43. In regards to claim 12, Zetl discloses in figures 1a-1c, a process for improving the field emission of an electron field emitter, comprised of an acicular emitting substance (13). Zetl further teaches in column 5 lines 45-55, that the emitters can be pressed in a direction essentially normal to the plane of the electron field emitter, thereby forming a new surface of the electron field emitter, and also that this process is simple.

44. Zetl is silent to the force resulting in fractures of the electron field emitter.

45. However, it is well known in the art that the force necessary to perform this particular process is sufficient to fracture some of the nanotubes in the acicular emitting substance.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the method of Zetl to improve the field emission of an electron filed

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emitter, including using a force resulting in fractures of the electron field emitter, since Zettl teaches this process is simple.

46. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zettl in view of Kim.

47. In regards to claim 59, Zettl teaches all of the recited limitations of claim 12 (above).

48. Claim 59 is rejected for the same reason as 8 (above).

49. Claims 77-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamoto.

50. In regards to claims 77-80 Nakamoto discloses all of the recited limitations of claims 61, and 76 (above).

51. Nakamoto further discloses that it is possible to use an acryl-series resin (acrylic), i.e. a thermally softened polymer film. Nakamoto further discloses that the resin layer is in a molten state.

52. Although Nakamoto is silent to heating the resin, this is an obvious step, since Nakamoto discloses in figure 6b that the thermally softened resin must be in a molten state to properly manufacture the device. One of ordinary skill in the art will realize that the addition of heat is needed to change an acrylic resin into a molten state.

53. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the electron emitting device using the process of Nakamoto, including heating the resin, since this is an obvious method of changing an acryl-series resin into a molten state.

Response to Arguments

54. Applicant's arguments filed July 28, 2003 have been fully considered but they are not persuasive.

55. Applicant admits in Item IV(a), that Nakamoto discloses a method for making a field emission cold-cathode device which comprises pressing a CNT layer (26), which is sticking to a collecting member (42), to an molten synthetic resin layer (44), which when dried, has sufficient adhesive force, so that when the collecting member is removed, the CNT is separated from the collecting member and remains on the dried resin layer. Applicant argues that Nakamoto's collecting member is not intended to be used as an electron field emitter.

56. However, the Examiner respectfully points out that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). It can be seen that Nakamoto's collecting member can be used as an electron field emitter before, and after the transfer process, if enough electrical power is applied to it, and therefore meets Applicant's limitations of claim 1.

57. Applicant argues in Items IV(b) and IV(c) that Nakamoto does not teach or suggest (i) a process in which a material forms an adhesive contact with an electron field emitter, and (ii) that a process in which a force is applied essentially normal to an electron field emitter, or (iii) an article is improved as a result of either of those processes. In regards to (i), see the above

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response. In regards to (ii), it can be seen that the process shown in figures 6a - 6d will consist of applying a force essentially normal to the electron field emitter (42). In regards to (iii), the article characterized by improving emissions as a result of either of those processes is shown at Fig. 6D.

58. The Examiner is hereby withdrawing the 103(a) rejection to claim 2 and the corresponding dependent claims made in the previous Office Action. Applicant's argument at Item V is now moot. The 102(e) rejection made in the previous office action to claim 2 stands, and it is now applied to the corresponding dependent claims, i.e. claims 4, 25, 26, 31, 32, 35, 36, and 38.

59. Applicant argues in Item VI that there is no motivation to use Bower's laser ablation grown single wall CNT's with Nakamoto's device. However, the Examiner respectfully directs Applicant to the above rejection. Further, column 5, lines 37-43 of U.S. Patent 6,203,864 to Zhang et al ("Zhang") is evidence that using these CNT's in an electron-emitting device is known in the art to operate properly. Zhang also discloses in column 5, lines 1-12, that single walled CNT's and multiwalled CNT's are art-recognized equivalents for their use in electron emission.

60. Applicant admits Item VII that Zetl discloses an electron beam field emission source comprises nanotubes bound into a matrix without using a binder, in which some nanotubes are fractured during a forming process. Applicant then argues that this has no relation to "applying a force to an electron field emitter." The Examiner respectfully disagrees, and points out that as broadly as recited, the electron field emitter of claim 12 is interpreted as Zetl's electron beam field emission source. Therefore, apply a force to the surface of the electron field emitter (via

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piston/cylinder device as recited by Zettl) fractures the electron field emitter, and forms a new surface of the field emitter. Claim 12 lacks limitations that would prevent one skilled in the art to interpret Zettl's electron beam field emission source as Applicant's electron field emitter.

61. Applicant admits in Item VIII that Kim teaches specific amounts of emitting material in an electron field emitter composition. Applicant then argues that Kim adds nothing to overcome the deficiencies of Nakamoto and Bower. The Examiner respectfully directs Applicant to the above rejections and discussion.

Conclusion

62. The Examiner is withdrawing the indication of allowable subject matter for claims 7, and 28 in the previous Office Action and has applied an art rejection above.

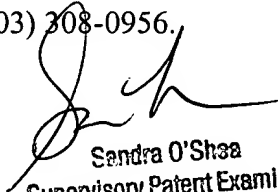
63. Amended claim 82 is acknowledged, however, no art rejection is made since Applicant requested an interference.

64. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Macchiarolo whose telephone number is (703) 305-7198. The examiner can normally be reached on 7:30 - 4:30, M-F.

65. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (703) 305-4939. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

66. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

pjm


Sandra O'Shea
Supervisory Patent Examiner
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